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REPRODUCTION APPARATUS

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90618 *Chrysomelidae*: *Chrysomelinae*. New species from the mountains of Mexico. **90619** *Chrysomelidae*: *Chrysomelinae*. New species from the mountains of Mexico.

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The optical disk reproduction apparatus 51 is controlled by means of a remote controller 53. The optical disk reproduction apparatus 51 reproduces image information recorded on an optical disk (not shown) and

the display 52 displays the reproduced image information.

Menu information for allowing the selection of one of a plurality of items is recorded on the optical disk. As the optical disk reproduction apparatus 51 reproduces the menu information, a menu is displayed on the display 52. The user selects one of the items contained in the menu by using the remote controller 53. For example, in the case where the menu exhibits a set of numbers correspondingly indicating the respective items, the user may press a key on the remote controller 53 that has the same number as the number of one of the indicated items to select the desired item from among the plurality of items in the menu. Alternatively, the user may press up/down/right/left keys on the remote controller 53 to cause a corresponding movement of a highlighted region which is displayed over the menu, and then press a decision key on the remote controller 53 to select the highlighted item from the items in the menu.

Next, a method for selecting one of a plurality of so-called "angles" (e.g., images respectively corresponding to different perspectives of the same scene or images respectively corresponding to different scenes) will be described. Such a plurality of "angles" are interleaved on the optical disk on which they are recorded, with different numbers being assigned to different "angles". When the optical disk reproduction apparatus 51 reproduces the data which is recorded in this manner, the motion pictures from only one "angle" are reproduced. During the reproduction of the motion pictures from that "angle", the user can press a number key on the remote controller to select another "angle"

corresponding to that number, whereby the motion pictures from that "angle" will begin to be reproduced.

5 However, the above-described prior technique of selecting one of a plurality of items contained in a menu by pressing a number key of a remote controller is not very interactive. Similarly, the above-described prior technique of selecting one of a plurality of "angles" during the reproduction of the motion pictures from only one "angle" is not very interactive because the user
10 needs to know in advance when it is possible to select from a plurality of "angles", i.e., when such "angles" are available. Therefore, a function for allowing an effective selection of menu items or "angles" is desired.

15 SUMMARY OF THE INVENTION

20 According to the present invention, there is provided a reproduction apparatus for reproducing stream data recorded on a recording medium, the stream data containing menu item coordinate information representing a display location of a menu item and image information representing an image. The reproduction apparatus includes: a reading section for reading the stream data
25 from the recording medium; an extraction section for extracting the menu item coordinate information contained in the stream data; a reproduction section for reproducing the image information contained in the stream data; a determination section for determining whether or not
30 the menu item has been selected by comparing the extracted menu item coordinate information against a user input in the form of coordinate information; and an execution section for executing a process corresponding to the menu

item if the menu item is determined to have been selected.

5 In one embodiment of the invention, the user input is supplied to the reproduction apparatus via a touch panel.

10 In another embodiment of the invention, the user input is supplied to the reproduction apparatus via a mouse.

15 In another aspect of the invention, there is provided a reproduction apparatus for reproducing stream data recorded on a recording medium, the stream data containing a plurality of selectable image information units. The reproduction apparatus includes: a reading section for reading the stream data from the recording medium; a reproduction section for reproducing the stream data; a detection section for detecting a period during which the plurality of selectable image information units contained in the stream data are reproducible; an image display section for displaying images respectively representing the plurality of selectable image information units during the period; a determination section for determining which one of the images representing the plurality of selectable image information units has been selected by comparing coordinate information fed as a user input via a pointing device and display location information representing display locations of the images; 25 and a control section for executing a process for displaying one of the images that has been determined as selected while not displaying the other images. 30

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In one embodiment of the invention, the pointing device is a mouse.

5 Thus, the invention described herein makes possible the advantages of providing a reproduction apparatus which allows the selection of desired image information in an interactive manner, by directly pointing to a menu item or an "angle" on the display with a pointing device, e.g., a touch panel.

10 This and other advantages of the present invention will become apparent to those skilled in the art upon reading and understanding the following detailed description with reference to the accompanying figures.

15 BRIEF DESCRIPTION OF THE DRAWINGS

20 Figure 1 is a view illustrating an optical disk reproduction system 1 according to the present invention.

 Figure 2 is a diagram illustrating the data structure of data which is recorded on an optical disk 21 according to Example 1 of the present invention.

25 Figure 3 is a block diagram illustrating the structure of an optical disk reproduction apparatus 11 according to Example 1 of the present invention.

30 Figure 4 is a diagram illustrating menu items available during reproduction according to Example 1 of the present invention.

 Figure 5 is a view illustrating a conventional

optical disk reproduction apparatus.

Figure 6 is a diagram illustrating the data structure of data recorded on an optical disk 611 according to Example 2 of the present invention.

Figure 7 is a block diagram illustrating the structure of an optical disk reproduction apparatus 70 according to Example 2 of the present invention.

Figure 8 is a diagram illustrating exemplary reproduced image data according to Example 2 of the present invention.

15 Figure 9 is a view illustrating the structure of
an optical disk reproduction system 9 according to the
present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

(Example 1)

Hereinafter, the present invention will be described by way of examples, with reference to the accompanying figures.

Figure 1 illustrates an optical disk reproduction system 1 according to the present invention.

The optical disk reproduction system 1 includes:
30 an optical disk reproduction apparatus 11 for reproducing
image information and/or audio information recorded on an
optical disk (not shown); a display 12, e.g., a televi-
sion set, for outputting image information and/or audio

information reproduced by the optical disk reproduction apparatus 11; and a touch panel 13 overlaid on the screen of the display 12. The touch panel 13 functions as a position detection device for detecting a position in the displayed image on the display 12. The position information which has been detected by the touch panel 13 is input to the optical disk reproduction apparatus 11.

Figure 2 illustrates the data structure of MPEG2 stream data 22 recorded on an optical disk 21. The MPEG2 stream data 22 is reproduced by the optical disk reproduction apparatus 11 shown in Figure 1.

The MPEG2 stream data 22 includes at least a private stream 221 and image information 222. The private stream 221 includes highlight data 221a and valid duration information 221b. The highlight data 221a is inserted in the MPEG2 stream data 22 at predetermined time periods. The valid duration information 221b represents the duration for which the control information in the highlight data 221a is valid. The valid duration of the highlight data 221a is, by default, the period of time between the time when the highlight data is processed and the time when the next highlight data is processed.

The highlight data 221a includes selection item information 221a-1 to 221a-n (where n is an integer equal to or greater than 1). The selection item information contains information concerning an item (hereinafter referred to as "selection item") to be displayed for selection. For example, the selection item information includes data for highlighting a certain rectangular

30 The data reading section 31 reads the MPEG2 stream data 22 recorded on the optical disk 21, and outputs the MPEG2 stream data 22 which has been read to the MPEG2 stream data reproduction section 32. In addition, the data reading section 31 extracts the

private stream 221 contained in the MPEG2 stream data 22 which has been read, and outputs the extracted private stream 221 to the private stream acquisition section 33.

5 The MPEG2 stream data reproduction section 32 receives the MPEG2 stream data 22 from the data reading section 31, and reproduces the received MPEG2 stream data 22. The MPEG2 stream data reproduction section 32
10 outputs the reproduced MPEG2 stream data 22 to the display 12 (Figure 1). The display 12 (Figure 1) displays the reproduced MPEG2 stream data 22. By reproducing the image information 222 (Figure 2) contained in the MPEG2 stream data 22, an image is displayed on the display 12. By reproducing the selection item information 221a-k (Figure 2), a menu item is displayed on the
15 display 12.

 The private stream acquisition section 33 obtains the private stream 221 from the data reading section 31
20 and extracts the menu item coordinate information 221a-k1 and control information 221a-k2, as well as the valid duration information 221b (Figure 2) from the acquired private stream 221.

25 The extraction of the menu item coordinate information 221a-k1 is achieved by analyzing the highlight data 221a contained in the MPEG2 stream data 22 at a highlight data analysis section 331. The extraction of the control information 221a-k2 and the valid duration
30 information 221b is performed by a control information acquisition section 332.

 The extracted menu item coordinate informa-

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comparison section 35 assumes that the selection item has been pointed to and outputs a control signal to the control information processing section 34 instructing that the rectangular highlighted region should be moved to the position at which the selection item is displayed. Having received the control signal, the control information processing section 34 controls the display so that the rectangular highlighted region is moved accordingly. If a position within the rectangular highlighted region (representing a selection item) is determined to have been pointed to for a predetermined period of time or longer, the position comparison section 35 determines that the selection item has been selected. The position comparison section 35 outputs control information corresponding to the selection item to the control information processing section 34. Based on the input control information, the control information processing section 34 controls the data reading section 31 so as to reproduce motion picture information which has been selected.

The control information processing section 34 receives the control information 221a-k2 and the valid duration information 221b from the control information acquisition section 332 (included in the private stream acquisition section 33), as well as the control information from the position comparison section 35, so as to control the data reading section 31 based on the received information. Under the control of the control information processing section 34, the data reading section 31 reads the necessary MPEG2 stream data.

Figure 4 illustrates an exemplary image displayed

on the display 12, with three selection items (i.e., menu items 1 to 3) being displayed by reproducing the MPEG2 stream data. Although not shown in Figure 4, a touch panel 13 (Figure 1) is provided so as to overlay the screen of the display 12.

The menu item 1 is a rectangular region defined by two diagonal positions respectively having the coordinates (X_1, Y_1) and (X_1', Y_1') . The coordinates (X_1, Y_1) and (X_1', Y_1') are represented by, for example, the menu item coordinate information 221a-11 contained in the selection item information 221a-1 shown in Figure 2.

The menu item 2 is a rectangular region defined by two diagonal positions respectively having the coordinates (X_2, Y_2) and (X_2', Y_2') . The coordinates (X_2, Y_2) and (X_2', Y_2') are represented by, for example, the menu item coordinate information 221a-21 contained in the selection item information 221a-2 shown in Figure 2.

The menu item 3 is a rectangular region defined by two diagonal positions respectively having the coordinates (X_3, Y_3) and (X_3', Y_3') . The coordinates (X_3, Y_3) and (X_3', Y_3') are represented by, for example, the menu item coordinate information 221a-31 contained in the selection item information 221a-3 shown in Figure 2.

Although the positions of the menu items are denoted by coordinates in the present example, any other denotation method can be employed as long as the positions of the menu items can be specified. Although the menu items are illustrated as rectangular regions in the present example, the shapes of the menu items are not

Now, the method of determination by the position comparison section 35 (Figure 3) as to whether or not a menu item has been selected will be described in more detail.

$$\begin{aligned} X_n &> X_1 \text{ and } X_n < X_1' \\ Y_n &> Y_1 \text{ and } Y_n < Y_1' \end{aligned} \quad \dots \text{ eq. 1}$$

If eq. 1 is satisfied, the menu item 1 is determined to have been pointed to because the input position is within the rectangular region specified by the menu item coordinate information.

30 If the menu item 1 is determined to have been selected (i.e., after the menu item 1 is determined to have been pointed to for a predetermined period of time or longer), the control information corresponding to the menu item 1 is output to the control information processing section 34. Based on the input control information,

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tion apparatus according to the present invention is coupled to a computer, a pointing device, e.g., a mouse, or a pen tablet, can be utilized as the detection device for detecting a position on the display.

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In the case where the displayed image on a computer display is enlarged or reduced, it is still possible to properly determine which position in the displayed image is pointed to because the computer can keep track of the original size of the image under reproduction in such a manner that it can calculate which position in the original image is being pointed to relative to the position which is input on the actually displayed image. The calculation result can be output to the optical disk reproduction apparatus as relative position information.

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(Example 2)

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Hereinafter, a second example of the present invention will be described with reference to Figures 6, 7, 8, and 9.

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Figure 9 illustrates the structure of an optical disk reproduction system 9 according to the present invention.

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The optical disk reproduction system 9 includes a computer 92, a display 93, and a mouse 94 as a detection device for detecting a position in an image which is displayed on the display 93. The computer 92 includes an optical disk reproduction apparatus 70 internalized therein.

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The MPEG2 stream data 612 includes management

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the recorded position of each angle block. By detecting the angle reproduction period 622, it becomes possible to reproduce and display images viewed from a plurality of "angles" on the same displayed image, as described later in more detail.

Figure 7 illustrates the structure of the optical disk reproduction apparatus 70.

The optical disk reproduction apparatus 70 includes a data reading section 71, an MPEG2 stream data reproduction section 72, a control section 73, a storage size/position change section 74, an image data output section 75, and an image data storage section 76.

The data reading section 71 reads the MPEG2 stream data 612 recorded on the optical disk 611. The data reading section 71 stores predetermined units of the MPEG2 stream data 612 which has been read in an internal memory buffer (not shown). The data reading section 71 outputs the MPEG2 stream data 612 which is stored in an internal memory buffer to the control section 73. The data reading section 71 receives the result of determination of the kind of data contained in the MPEG2 stream data 612 from the control section 73. Based on the received determination result from the control section 73, the data reading section 71 outputs the image information 630 and the audio information 631 contained in the MPEG2 stream data 612 to the MPEG2 stream data reproduction section 72, and stores the management information 628a to 628c in the memory buffer. Furthermore, the data reading section 71 receives control information from the control section 73 indicating which

angle block should be read out, and reads only the blocks of the selected "angle" from the optical disk 611.

5 The MPEG2 stream data reproduction section 72 receives the image information 630 and the audio information 631 from the data reading section 71. The MPEG2 stream data reproduction section 72 separates the received image information 630 from the audio information 631, and reproduces the image information 630 and the audio information 631 by subjecting them to conversion processes as necessary. The MPEG2 stream data reproduction section 72 outputs the reproduced image information 630 (as image data 630') to the storage size/position change section 74, and the reproduced audio information 631 (as audio output data 631') to the exterior of the optical disk reproduction apparatus 70.

20 The control section 73 receives the MPEG2 stream data 612 from the data reading section 71. An analysis section 731 analyzes the MPEG2 stream data 612 in order to determine whether the analyzed data is the image information 630, the audio information 631, or the management information 628a to 628c, following a method according to the MPEG2 specification. The control section 73 outputs the determination result to the data reading section 71.

30 If an angle reproduction period 622 (Figure 6) is reached during the reproduction of the MPEG2 stream data 612, the analysis section 731 of the control section 73 detects that the currently-reproduced period is an angle reproduction period, based on the determination of the management information stored in the internal

memory buffer. If the currently-reproduced period is thus determined as an angle reproduction period, the analysis section 731 further analyzes the management information 628a to 628c stored in the internal memory buffer. The calculation section 732 calculates the number of subsections (i.e., angles) into which the displayed image is to be divided (in accordance with the number of interleaved "angles"), as well as the reduction rate for each "angle" image. For example, if the number of "angles" is four, then the displayed image is to be divided into four subsections, requiring a reduction rate of 1/4. Once the number of subsections of the displayed image and the reduction rate are thus determined, the control section 73 outputs a stored information signal 735 (containing the number of subsections of the displayed image and the reduction rate) to the storage size/position change section 74. The output of the stored information signal 735 is made based on the angle number of the angle block under reproduction.

The position information indicating a position on the display pointed to by the user with a mouse is detected by the position detection section 77 and the detected position information is converted into coordinate information representing coordinates on the plane of the display and output to the position comparison section 733. The position comparison section 733 determines which "angle" is being displayed at the position indicated by the position information which has been detected by the position detection section 77. As a result of the determination, the control section 73 controls the data reading section 71 so as to read only the angle block which is displayed at the position indicated by the posi-

The storage size/position change section 74 receives from the MPEG2 stream data reproduction section 72 the image information 630 (as image data 630') that has been subjected to necessary conversion processes, and receives the stored information signal 735 from the control section 73. Based on the reduction rate contained in the stored information signal 735, the storage size/position change section 74 reduces the size of the image data 630' received from the MPEG2 stream reproduction section 72. Furthermore, based on the number of subsections of the displayed image and the angle number contained in the stored information signal 735, the storage size/position change section 74 determines which position (hereinafter referred to as the "storage position") on the display the image data 630' is to be displayed, prior to storage in the image data storage section 76. The image data 630' is stored angle by angle. The storage position is preferably determined so as not to overlap with the displayed image of the image data 630' that has been previously stored; alternatively, the storage position may overlap with the displayed image of the previously-stored image data 630'.

After the size of the image data 630' is reduced and its storage position is determined, the storage size/position change section 74 outputs the image data 630' to the image data storage section 76.

The image data storage section 76 receives the image data 630' from the storage size/position change section 74 and stores the received image data 630'. The



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cycle of "angles". When updating the index images, the image data output section 75 reads and outputs the image data of all storage regions in the image data storage section 76. As a result, the user can visually recognize that the angle reproduction period 622 in the MPEG2 stream data 612 is being reproduced, and further visually recognize which "angles" are available in this angle reproduction period 622.

During the above-described index image displaying process, the user can determine the "angle" which the user desires to reproduce and designate a position where that "angle" is being displayed by using the mouse 94 (Figure 9). Upon the designation made by the user, the control section 73 terminates the index image displaying process and controls the data reading section 71 so as to read only the selected "angle" (similarly to the case of reproducing a single image). Thereafter, the selected "angle" is displayed on the display 93 (Figure 9).

The determination as to which "angle" has been selected is made in a position comparison section 733 (Figure 7) in a similar manner to the determination illustrated in Example 1 concerning whether a menu item has been selected or not, i.e., based on a coordinate denotation of a position in the displayed image that has been input by the user via the mouse 94 (Figure 9), and on a coordinate denotation of the positions of regions displaying the respective "angles" as calculated based on the number of subsections of the displayed image and the reduction rate. Thus, it can be determined which "angle" is being displayed at the position that has been input by the user via the mouse 94.

Thus, an optical disk reproduction apparatus has been described which allows the selection of desired image information in an interactive manner, by directly pointing to one of a plurality of "angles" with a mouse coupled to a computer.

Although the selection of "angles" reproduced in the index image displaying process in the present example is described as being achieved by using a mouse to designate an angle position to be selected, the device for designating an angle position is not limited to a mouse. Alternatively, a pointing device such as a touch panel or a pen tablet as described in Example 1 can be used, for example. The user can select an "angle" in an interactive manner, the selection being known through comparison between a position on the display designated with such a pointing device and the positions of the index images.

Alternatively, the selection of the "angle" reproduced in the index image displaying process can be made by designating the number of the desired "angle" with a remote controller or the like.

In the case where the displayed image on a computer display is enlarged or reduced, it is still possible to properly determine which position in the displayed image is pointed to because the computer can keep track of the original size of the image under reproduction in such a manner that it can calculate which position in the original image is being pointed to relative to the position which is input on the actually displayed image. The calculation result can be output to



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more liberty in the creation of contents.

Furthermore, the user can control the display image by choosing an image on the display without necessarily comprehending, if at all, any numbers or letters.

In a multiple image mode, all the interleaved "angles" recorded on the optical disk can be reproduced and simultaneously displayed as index images composing one display image. A user can confirm the content of the "angles" based on the index images and visually select a desired "angle" without difficulty.

Various other modifications will be apparent to and can be readily made by those skilled in the art without departing from the scope and spirit of this invention. Accordingly, it is not intended that the scope of the claims appended hereto be limited to the description as set forth herein, but rather that the claims be broadly construed.